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I may mention that I have instituted a series of observations of this star with the express purpose of securing as accurate a determination as possible of the four cardinal points of variation.

As the orbit of the star has been demonstrated to be practically circular, the four dates—principal minimum, principal maximum, secondary minimum, secondary maximum—will yield accurate values of the dimensions of the system, inasmuch as—

(Duration of first quadrant + duration of third quadrant)
− (Duration of second quadrant + duration of fourth quadrant)
= four times the light-equation of the radius of the orbit.

Micrometrical Measures of Double Stars. (Third Series.)

By Rev. T. E. Espin.

The following list completes the measures obtained up to the end of 1905. The stars are all situated between +30° and +40°. Attention has mostly been given to stars neglected hitherto, and a large number of the stars noted as double in the Catalogues of the Astron. Gesellschaft were put on the working list. Subsequently Professor Burnham informed me that these are already sufficiently well cared for, and so only measures were continued where they had been already commenced.

Stars of Σ *and* OΣΣ.

No.	R.A. 1900		Dec.		P.	D.	Mags.		Nights.	Date.
	h	m	°	′	°	″				
OΣΣ 2 ...	0	26·2	+33	1	85·3	55·67			2	04·81
Σ 40 ...		29·8	36	16	315·1	11·29	7·1	8·4	3	04·86
OΣΣ 4 ...		31·5	33	10	173·9	36·11			1	04·80
Σ 62 ...		44·8	35	13	304·8	11·38	8·8	9·0	3	04·88
OΣΣ 11 ...	1	1·6	38	7	159·7	62·77	7·0	8·0	1	04·87
Σ 179 ...		47·3	36	50	159·1	3·29			3	05·88
Σ 434 ...	3	37·4	38	4	85·1	30·38	7·0	7·1	2	05·08
Σ 447 ...		41·4	38	3	167·6	27·39	7·0	9·2	2	05·08
Σ 1688 ...	12	48·8	38	31	343·9	14·08	...	...	2	05·29
Σ 1692 ...		51·4	38	51	228·0	19·81	...	...	3	05·31
Σ 1702 ...		53·9	38	50	83·0	35·23	...	...	2	05·29
OΣΣ 125...	13	42·7	39	2	237·5	71·08	5·0	8·5	2	05·39
Σ 1965 ...	15	35·6	36	58	303·1	6·37			2	05·38
Σ 1973 ...		42·7	36	45	322·6	30·44			2	05·38
Σ 2610 ..	14	55·4	+35	16	294·9	3·84	8·0	8·1	3	05·87
					203·3	12·01		11·5		

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No.		R A. 1900 h	m	Dec. °	′	P. °	D. ″	Mags.		Nights.	Date.	
Σ 2876	...	22	7·7	+37	9	67·5	11·68	...	...	4	04·91	
Σ 2882	...		9·9	37	15	326·4	3·07	9·0	9·1	3	04·90	
Σ 2894	...		14·5	37	16	193·9	15·38	6·5	8·0	2	04·89	
OΣΣ 243	...	23	5·4	36	19	319·1	66·98	6·5	7·0	2	04·78	
Σ 3028	...		33·6	34	29	201·9	17·13	6·5	9·5	2	05·05	
Σ 3050	...		54·4	+33	10	216·4	2·61	...	...	2	05·05	

h's Stars.

No.		R A. 1900 h	m	Dec. °	′	P. °	D. ″	Mags.		Nights.	Date.	
h 624	...	0	23·8	+33	20	347·0	15·28	8·9	11·2	2	05·40	
h 636	...	1	8·8	30	0	287·5	20 08	7·2	11·0	2	04·78	
h 1081	...		24·3	41	0	317·3	9·35	9·0	9·3	2	04·86	
h 1087	...		31·4	38	31	73 5	11·37	9·0	10·0	3	04·83	
h 645	...		46·8	30	58	103·5	7·54	8·0	10·5	2	04·78	
h 1097	...		50·2	37	15	39·2	14 45	9·5	11·0	3	05·20	
h 1120	...	2	29·2	39	13	90·9	17·32	7·0	11·5	2	05·94	
h 654	...		38·0	34	42	44·6	36·76	7·5	11·0	2	04·82	
h 669	...	3	48 1	35	1	262·6	12·04	9·0	9·2	1	04·87	
h 496	...	11	16·1	37	21	328·9	28·28	9·0	9·8	2	05·24	
h 519	...	12	25·5	36	41	4·7	19·84	9·1	9·3	2	05·29	
h 554	...	14	28·3	35	11	294·4	12·05	9·2	9·5	2	05·38	AB
h 562	...		55·7	35	30	309·7	24·36	7·5	11·5	2	05·38	(Σ 1900 rej.)
h 565	...	15	0·0	33	57	104·6	33·19	8·1	10·5	2	05·38	
h 566	...		5·1	33	26	286·0	23·89	8·4	9·9	2	05·41	(Σ 1913 rej.)
h 2786	...		29·6	38	46	166·8	24·53	8·1	11·5	2	05·38	
h 1349	...	18	45·1	33	12	81·0	22·08	8·0	11·6	2	04·71	
h 1414	...	19	29·1	35	54	24·8	15·47	8·8	10·0	3	04·65	
h 1447	...		47·9	33	49	333·9	18·95	7·5	11·8	3	04·61	AB
						85·6	22·30	C =	13·2	3	05·04	AC
h 1449	...		49·2	32	47	284·0	7·80	9·0	12·2	2	04·72	
h 1471	...	20	0·7	31	55	4·4	29·18	5·9	11·5	3	04·63	
h 1523	...		25·5	40	40	349·4	14·07	9·0	9·4	2	04·77	*h* 357°·4
h 1526	...		26·8	35	1	329·6	8·72	8·8	8·9	3	04·74	
h 1535	...		29·3	33	2	246·3	15·86	8·0	13·5	2	05·91	A*a*(new)
						151·0	17·47	...	13·0	2	05·91	AB
						232·2	34·28	...	11·0	2	05·91	AC
h 609	...		29·5	40	12	327·1	25·73	8·7	8·9	2	04·71	
h 612	...		37·3	38	44	8·8	47·97	6·5	11·5	3	04·71	
h 1560	...		37·9	+35	33	246·2	11·13	9·0	11·5	2	05·93	AB
						74·3	24·98	...	13·0	2	05·93	AC

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No.	R.A. 1900		Dec.		P.	D.	Mags.		Nights.	Date.
	h	m	°	′	°	″				
h 1568	0	39·0	+35	34	43·8	11·19	8·7	11·5	2	05·93
h 1582		45·9	38	9	45·0	17·13	7·8	13·0	2	05·89 AB(new)
					327·4	27·22	...	11·0	3	05·92 AC
h 1586		48·3	35	21	260·9	15·62	7·8	12·7	2	04·71
h 1596		51·8	33	39	295·5	16·86	8·9	11·2	3	04·68 *h* 258°·6
h 1664	21	31·7	32	52	88·1	7·68	9·7	9·7	2	05·30
h 953	22	0·1	32	27	104·4	21·14	6·8	12·5	2	04·66
h 1756		17·5	40	10	286·8	21·54	7·0	11·7	3	04·76
h 965		24·6	34	0	140·8	29·78	8·4	9·2	3	04·74
h 1779		28·0	33	42	217·2	21·31	7·8	9·2	2	04·69 *h* 244°·9
h 1788		30·5	41	3	298·9	3·71	8·7	9·2	2	04·71
h 968		35·0	36	22	109·1	4·42	8·3	8·8	3	04·74
h 969		41·3	33	27	24·8	5·98	...	...	3	04·78
h 1813		44·1	41	4	61·6	9·36	8·9	9·0	2	04·98
h 1817		46·1	33	56	239·5	10·46	9·0	9·4	2	04·74 *h* 247°·5
h 1832		52·6	38	8	73·8	10·97	8·8	9·2	2	04·68
h 983	23	9·9	31	14	157·7	16·41	8·8	9·5	2	04·81
h 1882		22·9	38	51	323·4	13·00	9·0	13·0	3	05·95 *h* 306°·0
h 987		24·7	+31	40	280·5	12·62	8·8	11·7	2	05·93

Various Stars.

No.	R.A. 1900		Dec.		P.	D.	Mags.		Nights.	Date.
Σ 3064 rej.	0	3·2	+39	32	357·5	23·92	6·8	9·6	2	04·72
H*h* 6		14·8	37	41	18·6	70·39	6·5	8·9	3	04·82
A.G.C.	1	9·0	40	30	43·2	6·62	8·8	10·0	2	04·86
Σ 181 rej.		48·7	37	42	124·8	26·53	8·5	9·2	2	04·86
A.G.C.		50·3	35	33	70·1	5·24	8·7	8·9	2	04·80
Ho. 10		52·9	37	11	193·1	2·66	8·0	11·0	6	05·86
Σ 210 rej.		59·7	36	28	242·8	16·82	8·6	9·5	2	05·91
A.G.C.	2	34·8	34	24	288·1	9·96	9·0	9·2	1	04·87
A.G.C.	3	7·4	37	9	128·1	5·28	9·0	9·3	2	05·44
A.G.C.		9·1	38	18	246·0	9·46	8·5	8·8	1	05·77
Σ 1382 rej.	9	43·1	34	33	106·8	27·89	6·5	11·0	3	05·25
Holmes	17	52·1	39	31	99·7	5·30	8·6	9·2	2	04·61
Σ 2386 rej.	18	41·7	35	26	18·1	20·43	8·7	9·2	2	04·60
H*h* 583		46·2	32	41	73·2	36·71	5·5	13·0	2	04·84 (new)AB
					121·7	58·91	C = 9·5		3	04·83 AC
A.G.C.	19	1·9	37	53	4·0	5·58	8·7	9·1	3	04·65
H*h* 608		12·9	37	57	71·0	100·14	...	...	2	04·81 θ Lyræ
A.G.C.		31·0	35	5	278·9	11·42	9·0	9·8	3	04·76
A.G.C.		32·4	+36	4	332·3	2·99	9·0	9·4	3	04·65

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No.	R.A. 1900 h	m	Dec. °	′	P. °	D. ″	Mags.		Nights.	Date.
A.G.C. ...	0	39·5	+31	43	168·0	11·11	8·5	9·5	2	04·81
A.G.C. ...		39·7	34	36	158·3	5·29	9·1	9·3	3	04·75
A G.C. ...		57·9	31	22	354·7	12·81	8·7	9·1	2	04·84
Espin 202 ..		58·6	35	2	221·8	10·92	8·8	13·0	2	05·63 A*a*
Σ 2638 rej.	20	5·3	33	22	74·7	16·67	8·0	9·1	2	04·71
Aitken 281		6·8	34	34	169·3	3·87	8·6	8·7	2	04·94
A.G.C. ...		15·6	36	16	117·6	9·48	8·7	8·9	2	04·68
A.G.C. ...		20·5	31	53	342·6	5·51	8·0	8·6	2	04·67
A.G.C. ...		22·5	37	8	287·8	5·24	9·0	9·2	3	04·74
A.G.C. ...		25·5	37	11	210·9	3·76	7·5	8·3	6	04·83 AB
					200·7	11·65	9·0	10·7	2	04·90 CD
					99·9	87·97	...	...	2	04·90 AC
A.G.C. ...		30·3	40	12	267·3	9·26	8·5	8·8	2	04·71
A.G.C. ...		34·5	30	47	153·6	3·74	8·0	9·0	2	05·38
A.G.C. ...		41·8	36	25	205·4	6·26	8·9	8·9	2	04·74
A.G.C. ...		42·9	32	30	86·7	10·89	7·8	8·5	1	04·82
A.G.C. ...		56·4	33	47	30·4	6·68	8·0	10·0	2	04·83
A.G.C. ...	21	4·4	40	30	107·1	5·33	8·9	9·2	3	04·68
A.G.C. ...		15·0	38	44	114·1	5·77	...	...	2	04·68
S 799 ...		39·3	37	49	60·0	152·74	...	...	1	05·90 AB
					248·5	30·76	C = 14·0		2	05·93 BC (new)
A.G.C. ...	22	5·9	31	11	178·4	10·15	9·0	10·0	3	04·56
Espin 216...		33·3	36	9	0·4	2·32	9·5	11·0	3	05·87 BC
					39·4	45·07	A = 8·5		1	05·75 AB
H*h* 771 ...		34·8	38	32	48·6	61·23	4·7	9·6	2	04·64
H*h* 772 ...		37·0	39	42	15·9	69·32	...	...	2	04·68
A.G.C. ...		40·7	39	30	192·2	14·14	9·0	10·5	2	04·76
Espin 217...		40·9	36	23	61·5	3·11	10·7	11·4	3	05·86
					295·1	74·16	A = 8·3		2	05·81
Hu. 782 ...		40·9	33	28	322·4	1·95	9·7	10·2	2	04·79
A.G.C. ...	23	20·7	32	53	230·5	3·05	8·8	10·2	3	04·78
Sh. 348 ...		49·9	31	17	329·0	36·98	8·0	9·5	2	04·70
A.G.C. ...		50·6	37	56	53·4	5·03	9·1	9·2	2	04·71
A.G.C ...		52·1	+37	17	316·6	1·98	9·2	9·3	4	04·74

Notes.

h 1097. *h*'s place agrees with B.D. + 37°·416, and this has been accordingly measured. *h*'s description is: "In Cluster VII. 32; no particulars."

h 1120. *h*'s angle 100°·0. *h* gives a third star, 320° ± 25″, which was seen on each night, but not measured.

h 654. B.D. + 34° 504 taken, from which *h*'s place differs by − 1^{m} 9^{s} in R.A.

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h 1526. 1904 October 24 suspected A double. This is Ho. 760, who reverses the angle of AB, and had found the close pair earlier in the year.

h 1535. *h* gives AB 108° ± AC 240°·3. The great difference in *h*'s position and the nearer *comes* led me to suspect at first that he had observed some other star. Subsequently it seemed probable that the difference in position might be explained by giving A a P.M. of 0″·163 towards 38°·0. The faint *comes* "*a*" would then have been distant about 7″ at the time of *h*'s observation, and might easily be overlooked. Professor Bakhuyzen informs me that the results of the Leiden meridian observations show that A has a P.M. of 0″·168 towards 47° 30′. This would make "*a*" even closer at the time of *h*'s measures.

Various Stars.

H*h* 6. A star with large proper motion—according to Porter, 0″·314 at 202°·3.

Ho. 10. This is a difficult star to measure, but there is possibly some motion:

	P	D
Ho. 1884·56	P = 198°·5	D = 2″·50
Ho. 1893·86	196·6	2·58

Σ 1382 rej. Four *comites*, according to *h*. A 13·5 mag., P about the same distance as AB.

Hu. 782. Found and measured before Professor Hussey's results reached me.

Sh. 358. No alteration since β's measures. Washburn Obs., vol. i., p. 157.

New Double Stars. By Rev. T. E. Espin.

No.	B.D.	R.A. 1900		Dec.		P.	D.	Mags.		Nights.	Date.
	°	h	m	°	′	°	″				
222	+38·46	0	20·6	+38	14	152·5	5·30	8·6	9·5	2	05·89
223	...		41·5	38	15	262·5	3·82	9·5	9·5	3	05·83
224	37·130		41·8	38	5	344·8	10·56	8·6	13·7	2	05·86
225	37·138		42·8	38	6	250·9	6·49	9·0	14	2	05·86
226	38·144		49·9	38	27	282·4	6·10	9·0	12·5	2	05·79
227	34·293	1	34·6	34	17	78·1	3·76	9·3	9·8	2	05·90
228	...		51·0	37	30	9·5	3·51	9·7	9·7	3	05·79
229	37·497	2	5·2	37	37	38·2	1·67	9·0	10·5	4	05·87
230	...		8·2	37	40	301·6	2·86	9·3	9·9	4	05·87
231	37·606		35·6	37	59	81·1	3·95	8·7	9·5	2	05·83
232	39·654		46·6	39	29	188·8	2·30	8·7	9·6	2	05·94
233	34·722	3	37·4	35	0	80 ±	4 ±	8·6	12·0		05·87
234	33·710		39·0	33	34	*f*	5 ±	9·3	12·0		05·89
235	34·732		41·4	34	44	271·3	2·5	12·0	12·0	1	05·89 BC
						227·1	35·01	A =	8·7	2	05·88 AB
236	34·744		44·0	34	22	352·8	4·96	9·3	9·6	3	05·90
237	33·757		54·6	33	58	117·8	6·65	9·0	10·0	2	05·88
238	34·809		59·4	34	22	*sf*	2 ±	9·3	9·5		05·94